



## **SDG 6: Clean Water and Sanitation**

**ENSURE AVAILABILITY AND SUSTAINABLE  
MANAGEMENT OF WATER AND SANITATION FOR  
ALL**

Sustainable Development Goal 6 (SDG 6), often referred to as "Clean Water and Sanitation," is a critical component of the United Nations' 2030 Agenda for Sustainable Development. This goal addresses the global need for access to clean and safe drinking water, as well as improved sanitation facilities. Access to clean water is a fundamental human right, essential for life and a key driver of sustainable development. However, a significant portion of the world's population still lacks access to safe drinking water sources. This lack of access can lead to dire consequences, including the spread of waterborne diseases, increased child mortality, and economic challenges.

SDG 6 aims to ensure universal access to safe and affordable drinking water for all by 2030. It emphasises the need to protect and restore water-related ecosystems and improve water quality. Achieving this goal involves increasing water-use efficiency and reducing pollution while also addressing the scarcity of water in certain regions. Additionally, the goal focuses on improving sanitation and hygiene practices worldwide. Lack of access to adequate sanitation facilities is not only a public health concern but also an issue of human dignity. Billions of people lack proper sanitation, which can lead to environmental pollution and health problems.

Furthermore, the goal encourages sustainable water management practices to protect and restore water ecosystems such as rivers, lakes, and wetlands. It emphasises the importance of integrated water resources management, ensuring the sustainability of water use for agriculture, industry, and domestic purposes. This report delves into the efforts of the Indian Institute of Technology (IIT) Gandhinagar in fostering Sustainable Development Goal 6 (SDG 6) - Clean Water and Sanitation.

The IITGN campus has been designed with key sustainability features, such as water conservation, purification and recycling. IITGN also has dedicated courses and lab facilities working in the field of sustainable water resources and other water-related issues.

## **RESEARCH**

Prof Ghoroi and Dr Dixit's invention A Filter for Water Purification and a Process for its Manufacture was granted a patent. The research projects ongoing at the Institute during 2021-22, relating to water are as follows:

<b>PI/Mentor</b>	<b>Discipline</b>	<b>Project Title</b>	<b>Agency Name</b>
Pankaj Khanna	Earth Sciences	Sedimentologic and Sequence Stratigraphic Analysis and Interpretation for Carbonates and Deepwater Systems	Abreu Consulting and Training (ACT-Geo)
Vikrant Jain	Earth Science	Special Study to Determine the Impact of Different Drivers for Groundwater Depletion in OE/Critical Talukas of Banaskantha District	Gujarat Water Resources Development Corporation (GWRDC)
Soumyadip Sett	Mechanical Engineering	Surfaces for Water Collection from Humid Air	Symphony Limited
Soumyadip Sett	Mechanical Engineering	Enhanced Air-Water Interaction through Surface Coatings of Honeycomb Cooling Pads	Symphony Limited
Vimal Mishra	Civil Engineering	Climate Change Impacts on Hydropower in India	United Nations Development Programme (UNDP)

About 20 researchers at the institute have their research focus on water. Nearly 30 articles were published in reputed journals covering topics related to water scarcity, groundwater quality, wastewater treatment, water networks, groundwater depletion, sustainable stormwater management, water reuse, etc. in the years 2021 and 2022.

## **EDUCATION**

Several graduate and undergraduate courses are offered on sustainability, as well as water-related topics. Through our immersive educational programs, students gain the knowledge and skills to contribute to the

achievement of Sustainable Development Goal 6. By implementing sustainability modules in existing courses and advancing sustainability education nationally and internationally, the institute aims to develop a curriculum.

CE 202: Sustainability and Environment  
 CE 308A: Water Resource Engineering  
 CE 605: Remote Sensing of Land and Water Resources  
 CE 611: Advanced Engineering Hydrology  
 CE 625: Advanced Hydraulic Engineering  
 CE 633: Water Resource Systems: Planning and Management  
 HS 642: Structures and Hydrology in Ancient India  
 EH 601 N: Earth Surface Processes In The Anthropocene  
 EH 605: Modelling of Earth System & Sustainability  
 EH 602: River Morphology and Ecology  
 ES 635: Water Quality Engineering

The following Short Courses were offered relating to water:

<b>Event Program Name</b>	<b>Event Date</b>	<b>Discipline/Centre/Institute and Funding Agency</b>
Short Course on Management of Domestic WasteWater	November 15-19, 2021	Disciplines of Mechanical and Civil Engineering,
Short Course on Management of Domestic Wastewater - Conveyance, Treatment and Reuse: Paradigm Shift in Approach	August 20 to September 24, 2021	Discipline of Civil Engineering, IIT Gandhinagar

Several research labs at the Institute, as mentioned below, are dedicated to research on varied domains related to water:

- Water and Climate Lab
- Water and environment technology Lab
- Water energetics Lab
- Water resource engineering Lab Other labs
- Machine Intelligence and Resilience Lab
- Dry Process Technology (DryProTech) Lab
- DSIR-IITGN-CRTDH (Common Research & Technology Development Hub, CRDTH)
- State Climate Change Centre

## **OPERATIONS**

## **Water Supply and sanitation facilities**

- A water collection and distribution system which is environmentally responsible is operational on campus.
- The institute provides free drinking water for students, staff and visitors; water fountains and dispensers have been installed in the academic and hostel blocks.
- A flow metre is installed at the campus, measuring the total water volume extracted from the Narmada canal.
- The water quality parameters are checked daily by the Institute Works Department as a measure to prevent polluted water from entering the water system.
- During ongoing construction activities, the contractors are responsible for providing clean drinking water and a minimum level of safety and sanitation facilities for all workers.

## **Wastewater disposal, treatment, reuse and reduce**

- The housing for campus residents and hostels have the following features to minimise water use: low-flow faucet and shower heads, dual flush in toilets, waterless urinals, and efficient taps.
  - Throughout the campus water-saving aerators are used in all the washbasins, sink taps and faucets. These dispense water at a controlled rate by mixing air with the stream of water.
  - The institute has also established strategies to safely dispose of hazardous chemical waste on campus, and implements a programme to recycle electronic waste.
- The filling of overhead water tanks is automated, with 24x7 monitoring of water levels and pumps on/off to prevent overflow of water.
- Surfaces such as open grid pavements and planting beds (shrubs) have been used throughout the campus to reduce the imperviousness factor.
  - Thus, a system was developed to treat domestic sewage primarily through a biological process (natural wastewater system).
- The campus is a zero-discharge campus and supports full harvesting-recycling-reuse of water and wastewater, which also contributes to reducing the carbon and water footprints.
  - It treats all its sewage in an environmentally friendly sewage treatment plant that uses anaerobic reactors to digest sewage solids and a root zone treatment system, which treats the effluent to be later used for horticultural operations.
  - Capturing rooftop rainwater and using the topography for water recovery and root zone treatment and, once used, recycling all this water for irrigation purposes. The rooftop rainwater is captured in four underground Jal Mandaps of 50 lakh litres storage capacity, placed strategically across the campus.
  - Surface runoff of rainwater is captured through a series of drainage pipes and sent to the seasonal ponds through intake wells. The overflow of the ponds goes to the Sabarmati River.

## **COMMUNITY OUTREACH**

In October 2021, IITGN hosted a 13-member delegation from Leh-Ladakh and Kargil, representing various administrative bodies and organisations. The purpose of their visit was to gain insights into the wastewater management systems implemented at IITGN. This delegation consisted of administrative officers, councillors from the Ladakh Autonomous Hill Development Council (LAHDC), elected representatives from Leh and Kargil towns, the chairperson of the Block Development Council, executive

officers, ward members from Leh and Kargil Municipal Committees, engineers from the Public Health Engineering Department, and an urban planner from the Ladakh Ecological Development Group (LEDeG). The objective was to understand the sustainable and eco-friendly technologies in wastewater management employed at IITGN and explore their potential adoption in the extreme cold climate of their region.

In February 2022, a research team at IITGN, led by Prof. Gopinadhan Kalon, Assistant Professor in Physics & Materials Engineering, undertook a pioneering project to address the challenges associated with water purification. Their innovative approach involved creating controllable water transport channels within graphite crystals. They achieved this by employing an electric field and potassium chloride (KCl) ions, allowing only fresh water to pass through the crystal while blocking the movement of salt ions. This breakthrough has promising implications for highly efficient water filtration systems, inspired by the natural capillary effect utilised by trees in their water intake processes. What sets this method apart is its energy-efficient capillary process, which enables the spontaneous evaporation of water without requiring external pressure. The research team's work resulted in the back-calculation of a pressure of 50-70 bar, stemming from capillary and other forces operating within the nanoscale channels.

In the realm of recognition and accolades, IITGN has made notable achievements. In March 2022, the institute was awarded the 2nd prize in the category of 'Best Institution/Resident Welfare Association/Religious Organisation for Campus Usage' during the '3rd National Water Awards' held at Vigyan Bhawan, New Delhi. This award, initiated by the Ministry of Jal Shakti in 2018, acknowledges the contributions of various national stakeholders in the promotion of water resource management.

Furthermore, Professor Vimal Mishra, an esteemed member of the IITGN community, was elected as a Fellow of the National Academy of Sciences, India (NASI). NASI, the oldest science academy in India, honoured Prof. Mishra for his outstanding contributions that have significantly advanced the fields of water sustainability and climate research in the country.